PORTS AUTHORITY
COMMONWEALTH OF PUERTO RICO

Roosevelt Roads International Airport Master Plan

PBSJ
Caribe Engineering, CSP

September 2007

Final

Roosevelt Roads International Airport Master Plan

Prepared For:

PORTS AUTHORITY
COMMONWEALTH OF PUERTO RICO

Prepared By:

PBSJ
Caribe Engineering, CSP

In Association with:

PBSJ

September 2007

DEMAND/CAPACITY ANALYSIS

Roosevelt Roads International Airport

6

6.1 GENERAL

This chapter of the master plan analyzes the ability of the current facilities at the Roosevelt Roads International Airport (RRIA), as documented in Chapter 2, to meet forecast planning activity levels (Chapter 4). Thus, based on the forecasts, this chapter compares the projected aviation demand to the existing capacity of the facilities at the Airport to identify areas where additional facilities and improvements will be necessary. This comparison will then be used to determine facility requirements (Chapter 7) for the Airport, over the planning period.

6.2 AIRSPACE CAPACITY

Airspace capacity at an airport can be impacted when the flight paths of air traffic at nearby airports, or local navigational aids (NAVAIDS), interact to affect operations at the study airport. Additionally, obstructions near or in the approaches to an airport, that require aircraft to alter flight paths to avoid the obstructions can limit the number of aircraft processed, and adversely affect airspace capacity. Thus, a review of the obstructions, airports, and associated approach procedures that surround RRIA, was completed to determine airspace capacity. **Figure 6-1** illustrates the overall airspace surrounding RRIA, as depicted in Federal Aviation Administration (FAA) San Juan Sectional Aeronautical Chart, October 28, 2004.

6.2.1 Runway Orientation, Utilization, and Wind Coverage

RRIA has two existing runways. Runway 7-25 has a northeast-southwest alignment, while Runway 18-36 runs north and south. It is assumed that Runway 7-25 will be the only runway used throughout the majority of the planning period, and that Runway 18-36 would likely be recommissioned in the long-term phase. However, should demand increase to the point that conditions warrant the opening of Runway 18-36 prior to the later part of the planning period, a wind analysis for the entire airfield has been conducted.

The use and orientation of these runways was estimated to determine the capacity of the airfield, which is the sum of capacities determined for each operation (takeoff and landing). Each operation is defined by its direction, which is often influenced by wind, available instrument approaches, noise abatement procedures, airspace restrictions, and/or other operating parameters. The runway use configurations used for capacity calculations considered runway orientations of 7-25 only. The operations evaluated included utilizing the primary runway for east-west activity in visual flight rules (VFR) and instrument flight rules (IFR) conditions.

Runway use was determined through an analysis of statistical wind data obtained from the National Oceanographic and Atmospheric Administration's (NOAA's) National Climatic Data Center (NCDC) in Asheville, North Carolina, although historical data was available from neither the airfield itself nor Fajardo Airport. Therefore, wind data from Luis Munoz Marin International Airport (LMMIA) in San Juan was used as the best available for wind coverage analysis. This information was analyzed to estimate the percent of operations that typically use each runway, based on the type of aircraft, wind direction, and overall weather conditions. The resulting runway utilizations will later be factored into the capacity calculations for the airfield. **Table 6-1** presents projected

runway utilization for VFR and IFR conditions at RRIA.

Table 6-1. Projected Runway Utilization (Percent)

Runway	VFR Conditions	IFR Conditions
7	94.43	0.57
25	4.97	0.03

Source: NOAA, NCDC; August 2004, RRIA ATCT and Puerto Rico Ports Authority

The single most important criterion for runway orientation is wind coverage. The runways should provide the maximum opportunity for takeoff and landing into the wind. The FAA requires the crosswind coverage of the runway systems to be at least 95 percent. To determine the wind coverage at RRIA, a wind analysis was completed using Version 4.2D of the FAA's computer program, Airport Design for Microcomputers. Crosswind components of 10.5, 13, 16, and 20 knots were applied where appropriate. **Figure 6-1** illustrates the resulting wind rose for RRIA.

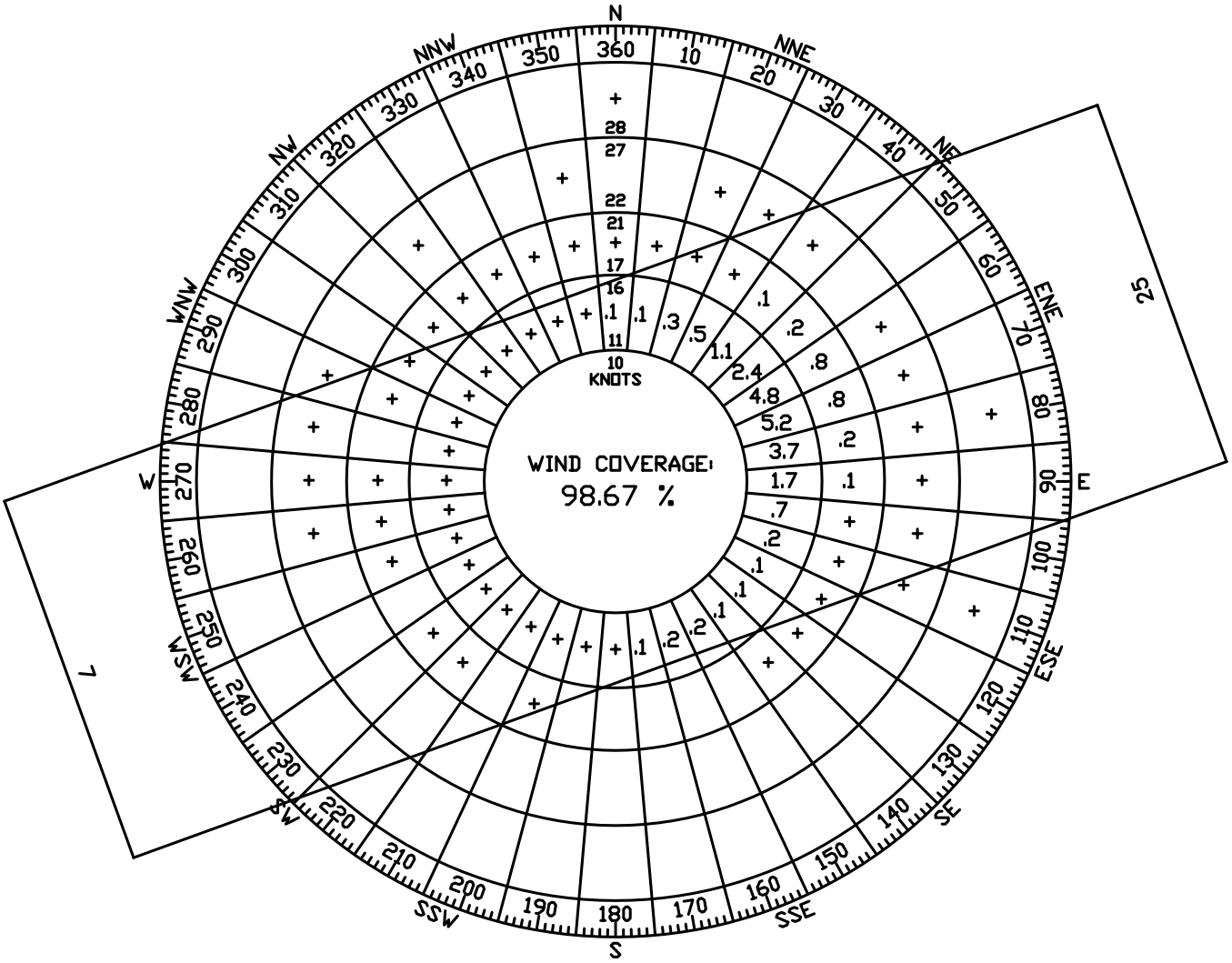
Crosswind coverage and maximum crosswind components are applied to runways based on the overall size of the aircraft utilizing the runway, and the FAA design group (A, B, C, or D) applied. Therefore, a crosswind component of 16 knots was applied to Runway 7-25, based on the aircraft design group for the runway. The wind analysis yielded 98.67 percent coverage for all weather conditions.

6.2.2 Airfield Capacity Parameters and Assumptions

Calculated airfield capacity is developed by methods, parameters, and assumptions described in FAA Advisory Circular (AC) 150/5060-5, Airport Capacity and Delay. The calculations are based on the runway utilizations that produce the highest sustainable capacity consistent with existing air traffic rules, practices, and guidelines. The criteria and values used in the AC 150/5060-5 are typical of U.S. airports with similar runway configurations, and are designed to enable calculation of airport capacity as accurately as possible. The parameters and assumptions identified in this section were used to calculate the airfield capacity for RRIA.

The following items, which will be discussed in this section, are evaluated as part of the airfield capacity calculations:

- Aircraft mix index
- Percent arrivals
- Percent touch-and-go
- Taxiway factors
- General airspace considerations
- Runway instrumentation
- Weather influences



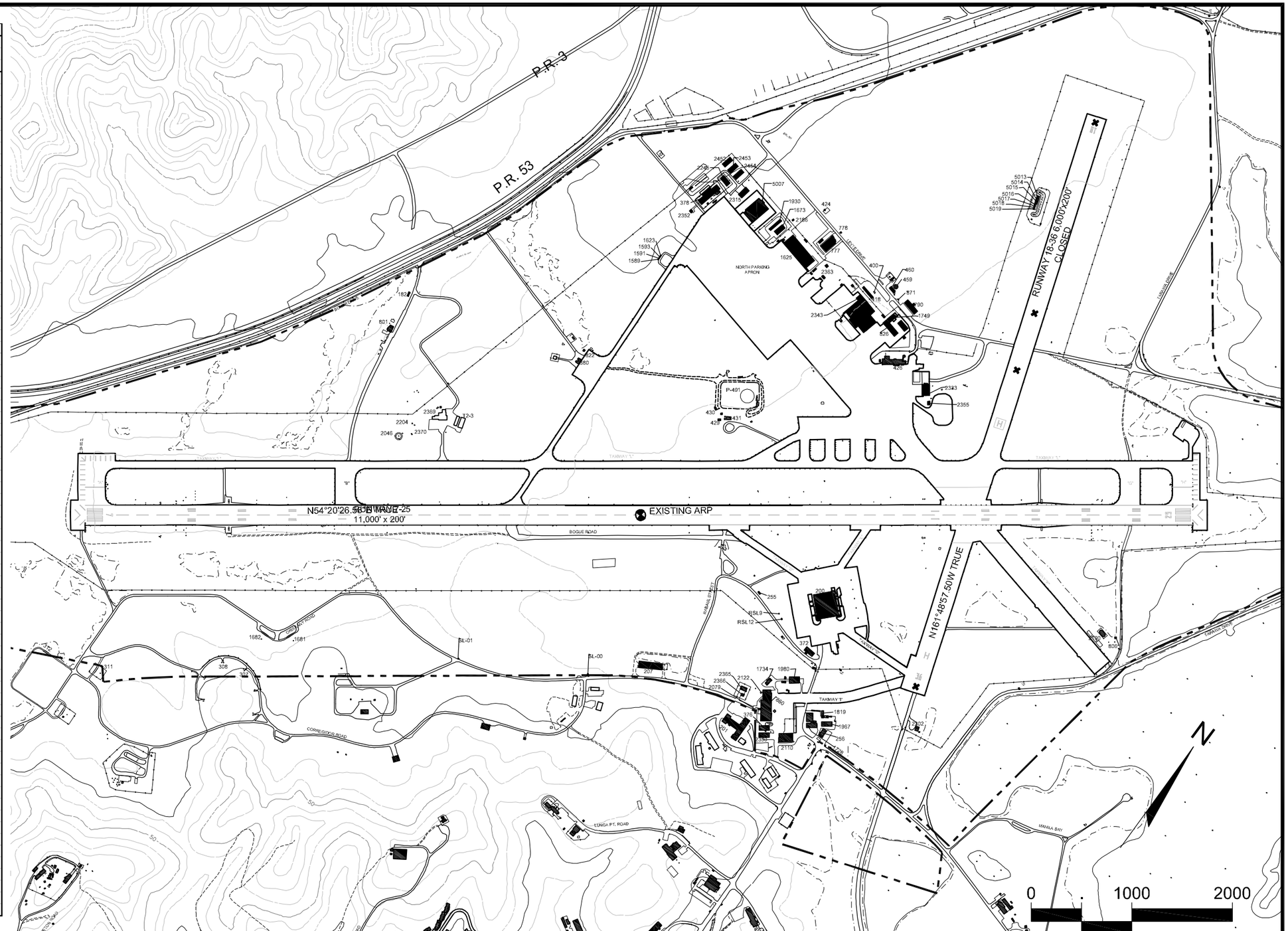
ALL WEATHER WINDROSE

STATION: SAN JUAN, PR #11641		RUNWAY COVERAGE	16 KTS
RECORD PERIOD: 1956 – 1978		7/25	98.67%
OBSERVATIONS: Est. 184,000			
SURFACE WINDS: CALM 15.1%			

SEPARATE IFR/VFR WIND ROSES NOT AVAILABLE

PBSJ Caribe Engineering, CSP	Roosevelt Roads International Airport Master Plan Ceiba, Puerto Rico	All-Weather Wind Rose	Ports Authority Commonwealth of Puerto Rico	Figure 6-1

EXISTING AIRPORT BUILDING LEGEND			
NUMBER	NAME	SQUARE FEET	ELEV.
182	To Be Determined	NA	NA
200	DHS	NA	NA
207	Storehouse	13,806	NA
255	Garbage House	400	NA
256	Storage	2,240	NA
307	Weapons Storage	187	NA
308	Weapons Storage	187	NA
309	Weapons Storage	187	NA
311	High Explosives Storage	1,404	NA
312	High Explosives Storage	144	NA
372	Aviation Warehouse	4,000	NA
378	Missile Handling Testing Building	19,308	NA
380	Missile Test Assembly Building	1,514	NA
400	To Be Determined	NA	NA
418	To Be Determined	NA	NA
424	To Be Determined	NA	NA
426	Operational Building Control Tower	20,988	NA
429	To Be Determined	NA	NA
430	To Be Determined	NA	NA
431	To Be Determined	NA	NA
459	Tank/Fire	1,688	NA
460	Pump House	1,492	NA
777	Shop	8,715	NA
778	To Be Determined	NA	NA
790	Photo Lab	6,758	NA
801	Flying Club	2,400	NA
806	To Be Determined	NA	NA
822	To Be Determined	NA	NA
826	Ground Supply Shop	6,920	NA
860	Drone Support Facility	29,172	NA
871	To Be Determined	NA	NA
1589	Weapons Storage	63	NA
1591	Weapons Storage	63	NA
1593	Weapons Storage	63	NA
1623	Weapons Storage	63	NA
1673	AIMD Storage	4,000	NA
1681	Weapons Storage	1,404	NA
1682	Weapons Storage	1,404	NA
1728	Shop	4,000	NA
1734	Drone Test Facility	2,241	NA
1749	Ground Supply Shop	4,000	NA
1819	Electronic Maintenance Shop	960	NA
1930	Equipment Shed	2,800	NA
1967	Maintenance Shop	4,000	NA
1980	Operational Storage	6,000	NA
2046	Training	962	NA
2079	Standby Generator Plant	420	NA
2186	Paint Locker	176	NA
2190	To Be Determined	NA	NA
2204	To Be Determined	NA	NA
2245	Storage	4,314	NA
2302	Airfield Alarm Control Center	1,200	NA
2315	Storage	4,800	NA
2333	Air Cargo Terminal	7,596	NA
2343	Aviation Support	9,088	NA
2350	Storage/Electrical Maintenance Shop	4,000	NA
2352	Maintenance Facility for 378	187	NA
2355	Runway Edge Lighting Dist. Building	711	NA
2363	CPO Hut	400	NA
2365	High Explosives Storage	2,303	NA
2366	Flammable Supply Storage	600	NA
2369	Generator	180	NA
2370	To Be Determined	NA	NA
2452	Administration Building	4,000	NA
2453	Maintenance Building	4,000	NA
2454	Warehouse	4,000	NA
5007	Storage	1,500	NA
T2-3	To Be Determined	NA	NA
SL-00	To Be Determined	NA	NA
SL-01	To Be Determined	NA	NA
RSL9	To Be Determined	NA	NA
RSL12	To Be Determined	NA	NA



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International Airport Master Plan
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Existing Facilities

Figure 12-2

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12.3 AIRPORT LAYOUT PLAN (ALP) AND DATA SHEET

The ALP is the primary planning document for the Airport and is a graphic representation, to scale, of existing and proposed Airport facilities, their location, dimensional and clearance data, and the overall infrastructure of the Airport including runways, taxiways, and aprons. The Data Sheet is typically used when space is not available within the ALP set for the necessary tabular information regarding the Airport and its facilities. In this case a second sheet, which includes information typically found on the ALP and other sheets, included within the ALP set is included. The FAA refers to the ALP and Data Sheet when considering grant applications for development assistance and when review potential impacts from off-airport development within the vicinity of the Airport.

The ALP set was developed in accordance with the design criteria and guidelines contained in FAA Advisory Circular 150/5300-13, Change 9, Airport Design. The information and analyses presented in the previous chapters of this report discuss the design requirements that pertain to the Airport and that have been incorporated into the ALP. **Figures 12-3 and 12-4** illustrate the Airport Layout Plan and associated Data Sheet, respectfully, for RRIA.

12.4 TERMINAL AREA PLAN

The Terminal Area Plan presents an enlarged area of the ALP at a scale of 1” = 400’, and illustrates existing and proposed facilities. This area is typically comprised of the terminal building, gates, aircraft parking apron, automobile parking, rental car parking, corporate hangars and non-aviation related development areas. The Terminal Area Plan is shown in **Figure 12-5**.

The Terminal Area Plan includes the portion of the airfield generally located to the north of Runway 7-25. The proposed terminal area is designed to more efficiently accommodate both domestic and international traffic growth at RRIA. In addition, the plan proposes constructing additional taxiways, auto parking facilities, as well as expansion of roadway access and remote auto parking.

12.5 GENERAL AVIATION AREA PLAN

The General Aviation Area Plans for RRIA, presented in **Figure 12-6,** delineate the planned improvements for the general aviation (GA) facilities in terms of location and concept development at the Airport. The GA area plan also depict the position of proposed hangars, current and future taxiways, Fixed Based Operator (FBO) facilities, access roadways, vehicle parking, and aircraft parking areas.

EXISTING AIRPORT BUILDING LEGEND

NUMBER	NAME	SQUARE FEET	ELEV.
200	Hangar	NA	73.53
182	To Be Determined	NA	NA
207	Storehouse	13,806	NA
255	Garbage House	400	NA
256	Storage	2,240	NA
307	Weapons Storage	187	NA
308	Weapons Storage	187	NA
309	Weapons Storage	187	NA
311	High Explosives Storage	1,404	NA
312	High Explosives Storage	144	NA
372	Aviation Warehouse	4,000	NA
378	Missile Handling Testing Building	19,308	NA
380	Missile Test Assembly Building	1,514	NA
400	To Be Determined	NA	NA
418	To Be Determined	NA	NA
424	To Be Determined	NA	NA
426	Operational Building Control Tower	20,988	88.75
429	To Be Determined	NA	NA
430	To Be Determined	NA	NA
431	To Be Determined	NA	NA
459	Tank/Fire	1,688	NA
460	Pump House	1,492	NA
777	Shop	8,715	NA
778	To Be Determined	NA	NA
790	Photo Lab	6,758	NA
801	Flying Club	2,400	NA
806	To Be Determined	NA	NA
822	To Be Determined	NA	NA
826	Ground Supply Shop	6,920	NA
860	Drone Support Facility	29,172	NA
871	To Be Determined	NA	NA
1589	Weapons Storage	63	NA
1591	Weapons Storage	63	NA
1593	Weapons Storage	63	NA
1623	Weapons Storage	63	NA
1673	AIMD Storage	4,000	NA
1681	Weapons Storage	1,404	NA
1682	Weapons Storage	1,404	NA
1728	Shop	4,000	NA
1734	Drone Test Facility	2,241	NA
1749	Ground Supply Shop	4,000	NA
1819	Electronic Maintenance Shop	960	26.04
1930	Equipment Shed	2,800	NA
1967	Maintenance Shop	4,000	37.72
1980	Operational Storage	6,000	NA
2046	Training	962	NA
2079	Standby Generator Plant	420	NA
2186	Paint Locker	176	NA
2190	To Be Determined	NA	NA
2204	To Be Determined	NA	NA
2245	Storage	4,314	NA
2302	Airfield Alarm Control Center	1,200	NA
2315	Storage	4,800	NA
2333	Air Cargo Terminal	7,596	62.7
2343	Aviation Support	9,088	NA
2350	Storage/Electrical Maintenance Shop	4,000	NA
2352	Maintenance Facility for 378	187	NA
2355	Runway Edge Lighting Dist. Building	711	NA
2363	CPO Hut	400	77.93
2365	High Explosives Storage	2,303	NA
2366	Flammable Supply Storage	600	NA
2369	Generator	180	NA
2370	To Be Determined	NA	NA
2452	Administration Building	4,000	NA
2453	Maintenance Building	4,000	NA
2454	Warehouse	4,000	NA
5007	Storage	1,500	NA
T2-3	Tower	NA	71..27
SL-00	To Be Determined	NA	NA
SL-01	To Be Determined	NA	NA
RSL9	To Be Determined	NA	NA
RSL12	To Be Determined	NA	NA

AIRPORT DATA

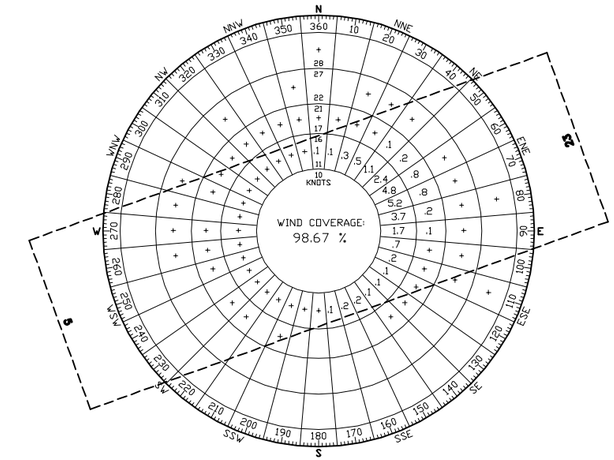
ITEM	EXISTING	FUTURE
AIRPORT ELEVATION	38' (AMSL)	SAME
AIRPORT REFERENCE POINT (ARP)	NAD 83 DATUM	
LATITUDE	18° 14' 42.97" N	18° 14' 52.95" N
LONGITUDE	65°38' 36.17" W	65°38' 27.82" W
MEAN MAX. TEMP	88° F	SAME
AIRCRAFT REFERENCE CODE	D-IV	D-IV
PRPA PROPERTY ACREAGE (FEE SIMPLE)	NA	1,600.8562 AC
EASEMENTS	NONE	8.2 AC.
MAGNETIC VARIATION	12°49' W	0° 2' W/YEAR
AIRPORT & TERMINAL NAVAIDS	MILITARY BEACON	CIVILIAN BEACON

RUNWAY DATA

ITEM	RUNWAY 07/25				RUNWAY 18/36			
	EXISTING		FUTURE 5/23		EXISTING		FUTURE 16/34	
RUNWAY CATEGORY (NPIAS)	NONE		COMMERCIAL		CLOSED		GENERAL AVIATION	
RUNWAY DIMENSIONS (L x W)	11,000' X 200'		SAME		6,000 X 200		5,800 X 100	
TRUE BEARING	N54°20'26.58"E		SAME		NA		N'161°48'57.50W	
EFFECTIVE GRADIENT (%)	0.26%		0.26%		NA		0.48%	
PAVEMENT TYPE	CONCRETE/ASPHALT		SAME		CONCRETE/ASPHALT		SAME	
PAVEMENT STRENGTH	SW 122,000 LBS		SW 122,000 LBS		NONE		SW 100,000 LBS	
	DWL 185,000 LBS		DWL 185,000 LBS		NONE		DWL 150,000 LBS	
	DTWL 338,000 LBS		DTWL 338,000 LBS		NONE		NONE	
RUNWAY LIGHTING	MIRL		HIRL		NONE		MIRL	
RUNWAY MARKING	PRECISION		SAME		NONE		NON-PRECISION	
TAXIWAY LIGHTING	MITL		SAME		NONE		MITL	
AIRCRAFT REFERENCE CODE	D-IV		SAME		NONE		D-II	
DESIGN AIRCRAFT	C-130		B767		NONE		GULFSTREAM 550	
FAR PART 77 APPROACH CATEGORY	NON-PRECISION		PRECISION		NONE		NON-PRECISION	
	RW 07	RW 25	RW 05	RW 23	RW 18	RW 36	RW 16	RW 34
NAVIGATIONAL AIDS	NONE	NONE	GPS, ILS, MALSR	GPS/LOC B.C.	NONE	NONE	GPS	GPS
VISUAL AIDS	PAPI	PAPI	PAPI, REIL	PAPI, REIL	NONE	NONE	PAPI, REIL	REIL, PAPI
APPROACH SLOPE	20:1	20:1	50:1	34:1	NONE	NONE	20:1	34:1
RUNWAY END COORDINATES (NAD83 DATUM)	18° 14' 10.71"	18° 15' 14.28"	SAME	SAME	18° 15' 40.57"	18° 14' 44.02"	18°15' 39.62"	18° 14' 44.96"
	65° 39' 22.54"	65° 37' 49.80"	SAME	SAME	65° 38' 21.90"	65° 38' 02.60"	65°38'21.58"	65° 38' 02.92"
RUNWAY END ELEVATION	37.81'	9.22'	SAME	SAME	39.77'	11.95'	39.77'	11.95'
APPROACH VISIBILITY MINIMUMS	NON-PRECISION	NON-PRECISION	PRECISION	NON-PRECISION	NONE	NONE	VISUAL	NON-PRECISION
RSA WIDTH	500'	500'	SAME	SAME	NONE	NONE	500'	500'
RSA LENGTH BEYOND RWY END	1,000'	1,000'	SAME	SAME	NONE	NONE	1,000'	1,000'
OFA WIDTH	800'	800'	SAME	SAME	NONE	NONE	800'	800'
OFA LENGTH BEYOND RWY END	1,000'	1,000'	SAME	SAME	NONE	NONE	1,000'	1,000'

FUTURE AIRPORT BUILDING LEGEND

NUMBER	NAME
A	Commercial Terminal
B	Maintenance Hangar
C	Cargo Hangar
D	Military Hangar
E	GA Box Hangar
F	GA T-Hangar
G	GA Terminal / FBO
H	Corporate Hangars
I	Corpoarte Terminal / FBO
J	Industrial Hangar



ALL WEATHER WINDROSE

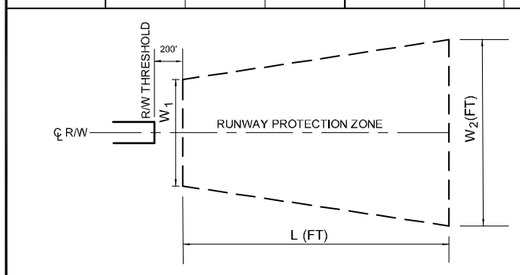
STATION: SAN JUAN, PR #11641
RECORD PERIOD: 1994–2003
OBSERVATIONS: Est. 184,000
SURFACE WINDS: CALM 15.1%

RUNWAY COVERAGE	10.5/15 (KTS/MPH)	13/15 (KTS/MPH)	16/18 (KTS/MPH)	21/24 (KTS/MPH)
7/25	98.15%	99.31%	99.91%	99.99%

SEPARATE IFR/VFR WIND ROSES NOT AVAILABLE

RUNWAY PROTECTION ZONE DATA

RUNWAY END	EXISTING			PROPOSED		
	L (FT)	W1 (FT)	W2 (FT)	L (FT)	W1 (FT)	W2 (FT)
05	NA	NA	NA	2,500'	1,000'	1,750'
23	NA	NA	NA	1,700'	1,000'	1,510'
16	NA	NA	NA	1,700'	500'	1,010'
34	NA	NA	NA	1,700'	1,000'	1,510'



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Airport Data Sheet

Figure 12-3

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